ASOS MODIFICATION NOTE 55 (for Electronics Technicians)
Engineering Division
W/OSO321:WW/WDW

SUBJECT	:	Installation of the Solid-State Time Delay Relay (SSTDR), Digital Output Module (DOM), and Uninterruptible Power Supply Bypass Circuit (UPSBC) into the Automated Surface Observing System (ASOS) Data Collection Package (DCP)
PURPOSE	:	In the event of a UPS failure, the addition of an SSTDR, DOM, and UPSBC will ensure a proper reset of the DCP while bypassing the UPS.
EQUIPMENT AFFECTED	:	All Class II ASOS DCPs and all Class I ASOS DCPs with an installed UPS.
PARTS REQUIRED	:	Modification kit S100-FMK95DCP (Class II DCP) 20" -14 gauge hook-up wire (not supplied in the FMK) Screw-on wire connectors (not supplied in the FMK)
MOD PROCUREMENT	:	This Field Modification Kit (FMK) will be initial issue by Washington Central Support and is required for all Class II DCPs or DCPs with a UPS.
EFFECTIVITY	:	All DCPs with UPS installed.
SPECIAL TOOLS REQUIRED	:	Drill, Motor (3/8") and drill bit, size: 5/32 inch (0.15625) Screw starter Wire Stripper Crimping Tool Small Slotted Screwdriver Medium Phillips Screwdriver *Only for systems with a SOLA UPS* AMP Pin extractor tool (P/N 305183-R) *Recommended for 2A1A2XA12P2 connections*: AMP Pin extractor tool (P/N 843473-1)
TIME REQUIRED	:	3 hours per DCP
EFFECT ON OTHER INSTRUCTIONS	:	Modification Notes 47 and 50 must be installed prior to or in conjunction with this modification.
AUTHORIZATION	:	This modification is authorized by ECP **E97SM05F093D**.

VERIFICATION STATEMENT	:	This modification is being tested for operational integrity at the operational test and evaluation (OT&E) sites listed in appendix A.

GENERAL

This modification note provides procedures for installing the SSTDR, DOM, and UPSBC into all ASOS DCPs with an installed UPS (Class I systems that have an UPS installed are also included in this modification.) When the UPS fails, the UPSBC bypasses the UPS allowing facility power to be directly applied to the DCP. The SSTDR will delay the activation of the DCP for 3 seconds. This delay ensures a proper reset of the ASOS's radio frequency modem(s), pressure sensors, and power supplies.

PROCEDURE

The following instructions are for the installation of the SSTDR (K1), DOM (K2), and UPSBC (XK3) assembly in the Class II DCP (and Class I systems with an UPS installed). If installing with Modification Note 47, complete the SSTDR, DOM, and UPSBC assembly pre-wiring instructions and complete steps 3 through 23 of the installation of the SSTDR, DOM, and UPSBC assembly.

SSTDR, DOM, and UPSBC (2A1A9) Assembly Pre-Wiring Instructions:

Note:
Pre-wiring each SSTDR, DOM, and UPSBC assembly before the module is installed at the DCP will simplify this modification and reduce installation time.

1. Ensure the FMK has all the parts listed in appendix C.

2. Slide the black plastic SSTDR bracket (P/N 62828-90427-2) onto the Din Rail supplied in the FMK. Install the SSTDR (K1) onto this bracket using the machine screw provided in the FMK. Refer to figure 1.

3. Slide the DOM (K2) onto the Din Rail according to the connector orientation illustrated in figure 1.

Note:
The yellow rectangular 5-amp fuse on the DOM K2 module is loose fitting. Be sure to check its seating in the K2 module after unpacking.

4. Locate the UPSBC (XK3) socket included in the FMK.

5. Into each side of the XK3 socket, push in the relay hold-down clips. Refer to figure 2.

6. Install the high-powered relay K3 into the relay socket XK3.

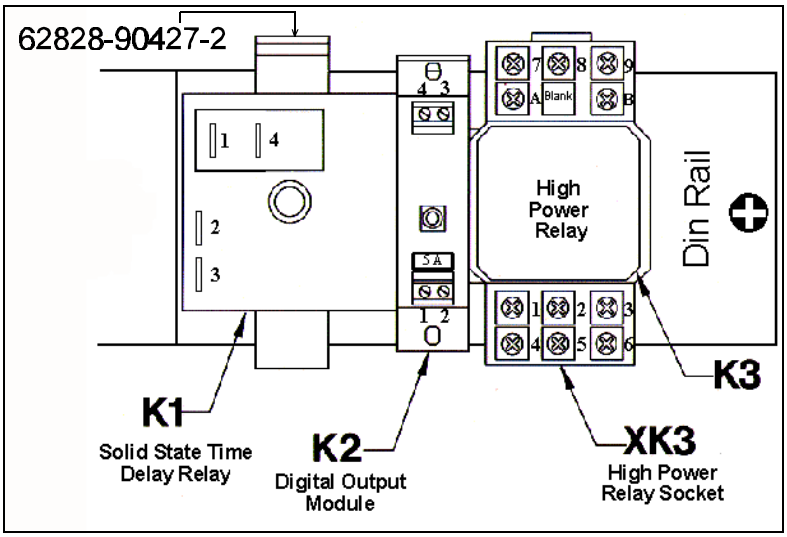


Figure 1 SSTDR, DOM, and UPSBC Assembly

7. Install the wire retainer over the K3 relay, and attach it to the relay hold-down clips. This wire will secure the K3 relay to the XK3 socket. Refer to figure 2.

8. Slide the XK3 assembly onto the Din Rail according to the connector orientation illustrated in figure 1.

9. Install the two plastic end clamps around the UPSBC assembly.

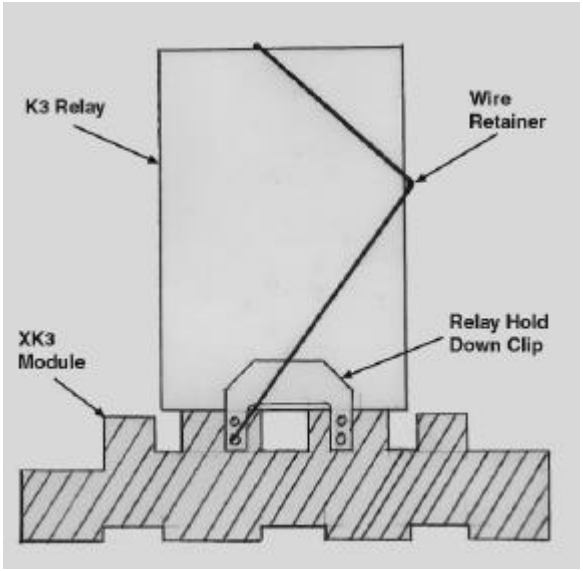


Figure 2 High Power Relay Side View

10. Perform the following steps in the order prescribed. The wires in steps a through d and t are found in wire bundle W132. The remaining wires are found in wire bundle W131.

Note:
Appendix B contains a complete wiring diagram of this modification note.

a. Connect wire labeled A9K1-2/A4-1C to K1-2.

b. Connect wire labeled A9K1-3/A4-9C to K1-3.

c. Connect wire labeled A9K1-1/A4-1B to K1-1.

d. Locate wire labeled A9K1-4/A4-12A. Remove this label, re-label it A1A9K1-4/A1A9XK3-2, and connect it to K1-4.

e. Connect wire labeled A1A9K2-4/A2XA12P2-C8 to K2-4.

f. Connect wire labeled A1A9K2-3/A2XA12P2-B1 to K2-3.

g. Connect wire labeled A1A9XK3-7/A2XA12P2-A23 to XK3-7.

h. Connect wire labeled A1A9XK3-8/A1A4-12A to XK3-8.

i. Connect wire labeled A1A9XK3-9/A1A4-17C to XK3-9.

j. Connect wire labeled A1A9XK3-A/A1A9K2-2 to XK3-A.

k. Connect wire labeled A1A9XK3-B/A1A9XK3-6 to XK3-B.

l. Connect wire labeled A1A9K2-1/A1A9XK3-5 to K2-1.

m. Connect wire labeled A1A9K2-2/A1A9XK3-A to K2-2.

Note:
There will now be two wires connected to XK3-5.

n. Connect wire labeled A1A9XK3-5/P33-1 to XK3-5.

o. Connect wire labeled A1A9XK3-5/A1A9XK2-1 to XK3-5.

Note:
There will now be two wires connected to XK3-6.

p. Connect wire labeled A1A9XK3-6/P33-2 to XK3-6.

q. Connect wire labeled A1A9XK3-6/A1A9XK3-B to XK3-6.

r. Connect wire labeled A1A9XK3-1/A2XA12P2-B2 to XK3-1.

Note:
There will now be two wires connected to XK3-2.

s. Connect wire labeled A1A9XK3-2/A1A6-BLK to XK3-2.

t. Locate the wire labeled A4-12A/A9K1-4 coming off K1-4. This wire will make the connection between K1-4 to XK3-2 and therefore can be shortened to a more suitable length, at this time, if desired. Attach a new label which reads A1A9XK3-2/A1A9K1-4. Crimp on a spade connector and connect this wire to XK3-2.

u. Connect wire A1A9XK3-3/A1A4-9C to XK3-3.

BEFORE INSTALLATION OF THE SSTDR, DOM, and UPSBC

1. Contact the ASOS Operations and Monitoring Center (AOMC) at 1-800-242-8194 and provide notification on which ASOS will have the SSTDR, DOM, and UPSBC(s) installed.

2. Get approval of the responsible MIC/OIC/Observer before starting installation. This modification may be installed on any day of the month if the restrictions in steps 3 and 4 are satisfied.

3. **Commissioned sites only:** Do not start installation during inclement weather, precipitation, instrument flight rule conditions, or if any of those conditions are expected within 3 hours. The responsible MIC/OIC/Observer will define those meteorological conditions.

4. Do not start installation at a time that will conflict with scheduled synoptic observations at ØØ, Ø3, Ø6, Ø9, 12, 15, 18, and 21Z. Allow 3 hours per assembly, per DCP, to complete installation and restart the ASOS.

5. Immediately before beginning work at National Weather Service (NWS)-staffed sites, the MIC/OIC/Observer will inform the air-traffic control tower (ATCT) and any other critical users that ASOS will be shut off for SSTDR, DOM, and UPSBC installation (for unstaffed sites, the electronics technicians will inform the ATCT).

6. Do not begin the installation process until immediately after an hourly observation has been transmitted. At NWS-staffed sites, normal back-up observing procedures will be implemented.

7. Make the appropriate SYSLOG entries, (MAINT-ACT-FMK) Mod 55.
   a. Log on as **TECH**.

b. Key the **MAINT** screen.
c. Key the **ACT** page.
d. Key **START** - Stop here and perform “INSTALLATION OF THE SSTDR, DOM, and UPSBC.”

INSTALLATION OF THE SSTDR, DOM, and UPSBC ASSEMBLY

A. Class II DCP SSTDR (K1), DOM (K2), and UPSBC (XK3) Assembly:

WARNING

Ensure the AC power is completely removed from the DCP. Death or severe injury may result if power is not completely removed from the DCP prior to installing the SSTDR, DOM, and UPSBC.

1. Open the DCP enclosure door, and remove power from the 2A1A3A1 circuit breaker by placing the switch into the **OFF** position.

2. At the AC junction box, open and remove power to the DCP by placing the DCP circuit breaker into the **OFF** position.

3. Unfasten the screw at the top of the circuit breaker rack and lower the assembly.

CAUTION:

Once the circuit-breaker (CB) rack has been lowered, be advised there are two Solid-State Relays above the PDB, *K1,* and *K2* and are to be disregarded while performing this modification. Their location is 2A1K1 and 2A1K2. The SSTDR, DOM, and UPSBC assembly for this modification will be located at 2A1A9-K1.

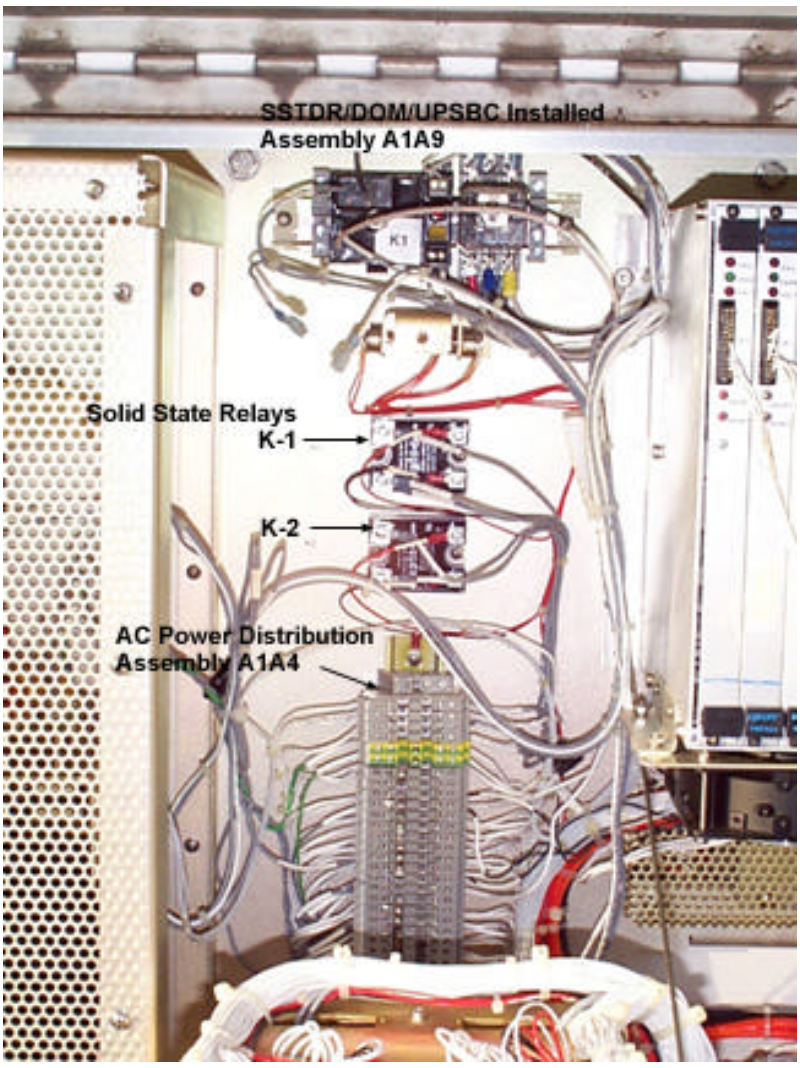


Photo 1 SSTDR, DOM, and UPSBC Installed

4. At the technician's discretion, the CB rack can be dismounted by removing three phillip #6 screws and spacer at the bottom of the CB rack and storing it to the right. Otherwise, with the safety lanyard detached from the right side of the CB rack, the rack must be lowered and gently rest on the edge of the DCP cabinet.

5. Above the thermal switches (2A1S1,S2,S3), there *may be* two nuts in the A1 backplate. If so, proceed to step 7, and if not, proceed with the next step. (Refer to figure 3).

6. Using a 5/32-inch (0.15625 inch) drill bit and the Din Rail as a template, drill two holes in the A1 backplate, 6.5 inches apart as designated in figure 3, to install the 2A1A9 assembly.

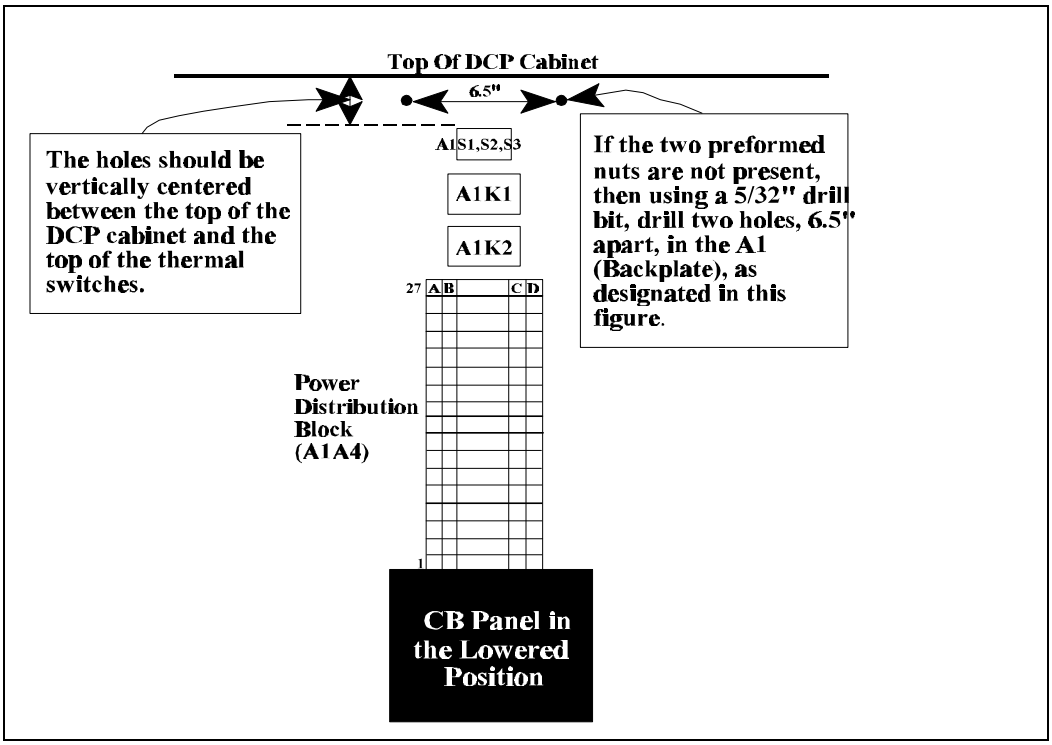


Figure 3 DCP SSTDR, DOM, and UPSBC Mounting Location within DCP Cabinet

7. Install the SSTDR, DOM, and UPSBC assembly, 2A1A9, behind the CB rack and above the PDB, 2A1A4, as shown in photo 1.

   a. *If the imbedded nuts were already installed*, use the two machine screws, flat washers, and lock washers to install the Din Rail onto the backplate.

   b. *If the holes were drilled*, use the two self-tapping screws, flat washers, and lock washers to install the Din Rail onto the backplate.

Note:

The SSTDR, DOM, and UPSBC assembly may present a tight fit between the thermal switches and the top of the DCP cabinet. One way to make this assembly fit, if needed, is to gently bend the spade connectors up so the wires can be collected and tied up out of the way.

8. Once installed, take the four thin, white wires destined for the digital input/output board, and tie these wires out of the way. These wires will be connected in step 13.

9. On the DCP power distribution block, (PDB) 2A1A4, remove and cap wires 2A1A4-1B, 2A1A4-12A, and 2A1A4-17C.

10. Connect the following six wires to the DCP PDB, 2A1A4. Photo 2 illustrates the location of these connections on the PDB.

Note:

When making connections to the PDB, ensure the wires are not inserted too far into their terminals. If this occurs and the terminal screw is tightened down, the wire insulation may prevent the contact from taking place.

Note:

Check each connection made to the PDB by giving a slight tug on each wire.

a. Connect wire labeled A4-1B/A9K1-1 to A4-1B.

b. Connect wire labeled A4-1C/A9K1-2 to A4-1C.

c. Connect wire labeled A1A4-12A/A1A9XK3-8 to A4-12A.

d. Connect wire labeled A1A4-17C/A1A9XK3-9 to A4-17C.

e. Connect wire labeled A1A4-9C/A1A9K3-3 to A4-9C.

f. Connect wire labeled A4-9C/A9K1-3 to A4-9C.

Note:

There will now be two wires connected to A4-9C.

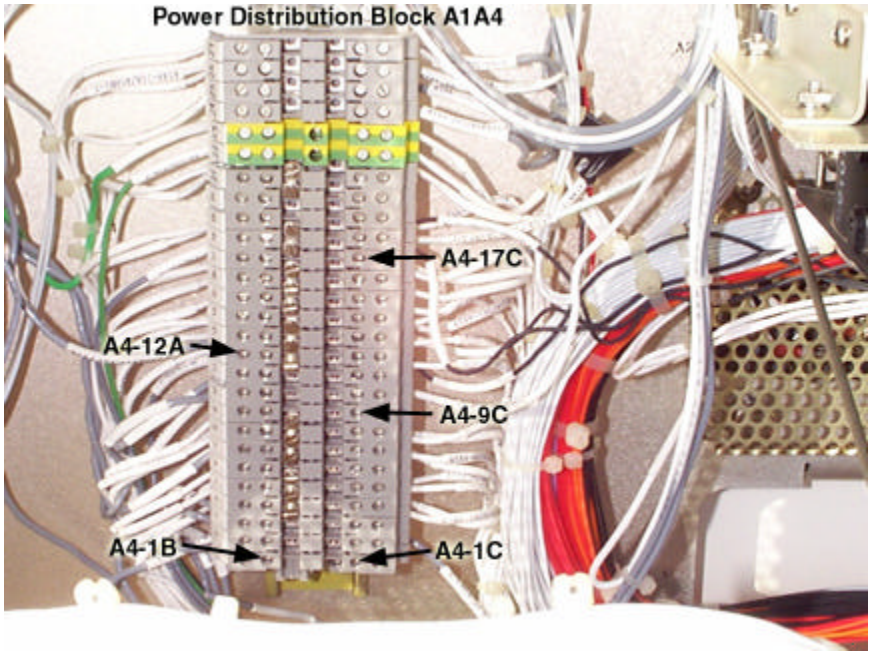


Photo 2 Power Distribution Block Connections

Note:
If the DCP has a Deltech UPS, skip step 11 and proceed with step 12

11. For a **SOLA** UPS, connect the following wires to the 1.5 KVA filter board, A1A6, on the UPS assembly. To make these wires connections easier, the metal wire-mesh covering can be removed which will expose the filter board.

    a. Using an AMP pin extractor (manufacturer's P/N 305183-R), remove the wires connected to A1A6P33-1, A1A6P33-2, and A1A6-BLK on the 1.5 KVA filter board.

    b. Connect wire P33-1/A1A9XK3-5 to P33-1. If this wire is too short, use a butt splice to add a 14-gauge wire extension of sufficient length to reach P33-1.

    c. Connect wire P33-2/A1A9XK3-6 to P33-2. If this wire is too short, use a butt splice to add a 14-gauge wire extension of sufficient length to reach P33-2.

    d. Connect wire A1A6-BLK/A1A9K3-2 to A1A6-BLK. If this wire is too short, use a butt splice to add a 14-gauge wire extension of sufficient length to reach A1A6-BLK.

    Photo 3 illustrates the wire connections onto the filter board with the metal wire-mesh cover in place on front of the UPS.

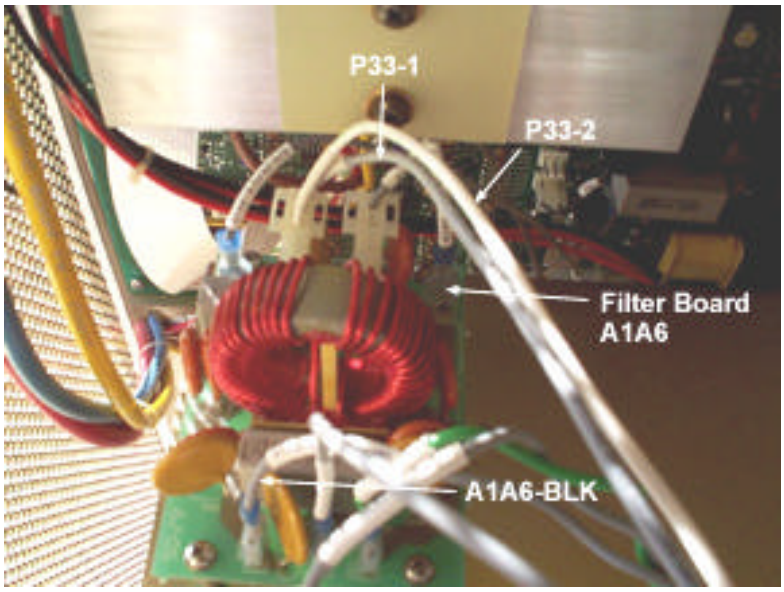


Photo 3 UPS Filter Board

12. This step is **only** for a DCP with a **Deltech** UPS. Proceed with the steps 12a, 12b, and 12c using photos 4 and 5 as guides.

a. Disassemble P33, remove and cap the gray wire (or completely remove this wire from the DCP, technician's discretion). Cut the connector on the gray wire P33-1/A1A9XK3-5, strip this wire, and connect it to P33.

b. Remove and cap the white wire (or completely remove this wire from the DCP, technician's discretion). Cut the connector on the white wire P33-2/A1A9XK3-6, strip this wire, and connect it to P33. Reassemble P33 and reconnect to the UPS.

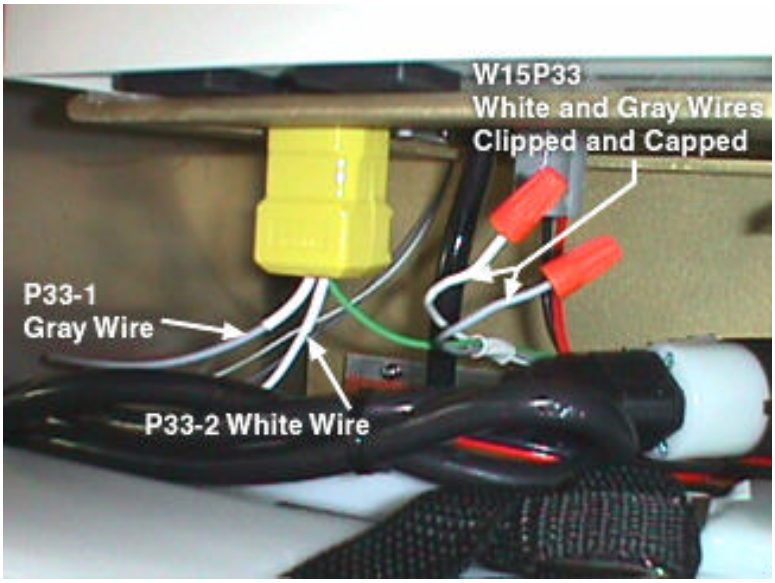


Photo 4 Yellow Output Receptacle Wiring

c. Remove the cable clamp restraining the W15P45. Disassemble P45. Remove and cap the gray wire (or completely remove this wire from the DCP, technician's discretion). Cut the connector on the gray wire A1A6-BLK, strip this wire, and connect it to P45. Reassemble P45 and reconnect to the UPS.

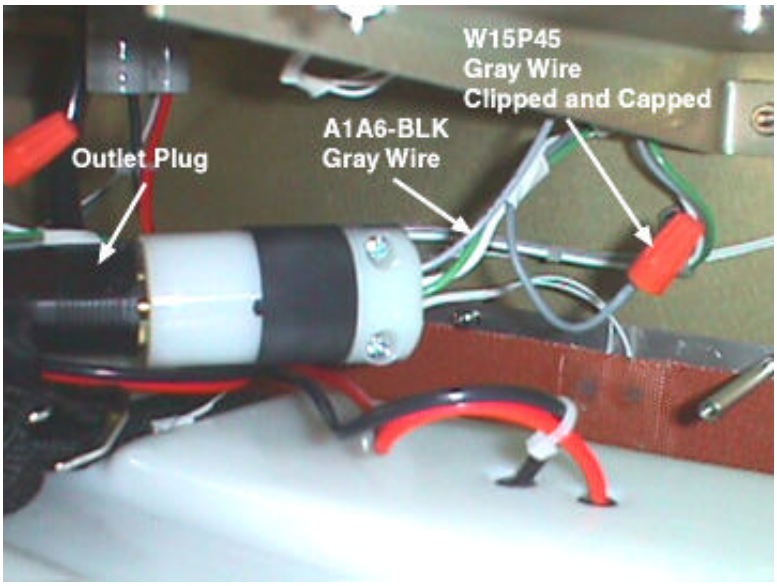


Photo 5 Line Cord Wiring

13. The following should be performed at the VMEbus cabinet:

a. Remove the digital input/output (I/O) board (2A1A2XA12) from the VMEbus cabinet. (This will reduce the likelihood of damaging the pins as they are pushed in from the back side of the terminal connector).

b. Remove the four nuts that secure the VMEbus cabinet to the DCP mounting plate and tilt the VME forward to allow rear access to the 2A1A2XA12P2 connector.

c. At the back of the DCP VMEbus cabinet, locate the lower portion (P2) of the digital I/O board's terminal connector (2A1A2XA12**P2**).

d. Unsecure the four thin wires as mentioned in step 8, on page 9.

e. Route these four wires under the VMEbus cabinet and up through the 2A1A2XA12P2 slot.

f. Insert the following wires into their respective slots on the P2 connector terminal. Refer to figure 4 for the location of each of these connections.

Note:

When inserting the wires into the digital I/O (1A2XA12) connector terminal (P2), orientate the locking pin down and be sure to listen for a "click" sound. This will indicate the pin is seated properly inside the connector terminal.

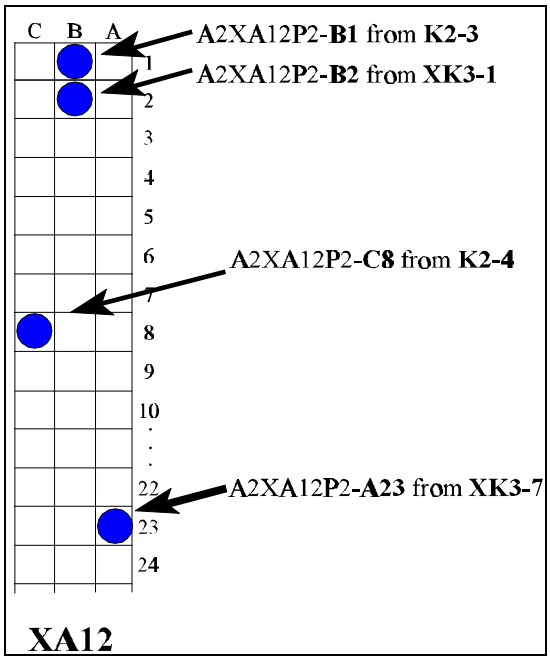


Figure 4 1A2XA12P2

g. Before reattaching the VMEbus cabinet to the backplate, check the tightness of the grounding wires and lug terminals on the VME backplane.

h. Reinstall the VMEbus cabinet to the DCP backplate.

i. Reinstall the digital I/O board into the VME chassis.

15. Spot tie all loose wires using the cable ties provided in the FMK. Apply all component labels to the SSTDR, DOM, and UPSBC.

16. Reinstall and secure the CB rack.

Note:
When power is reapplied to the DCP, there will be approximately a 3-second delay until the DCP begins to run.

17. Return the AC facility power to the DCP from the junction box.

18. Reinstate power from the CB 2A1A3A1CB1 to the DCP.

19. Turn on the DCP UPS.

Note:
If the DCP has a Deltech, clear any red LED status lights on the front of the UPS by pressing the front panel alarm silence/reset button.

20. With the red LED on K2 lit, verify there is 115 VAC present across pins XK3-A and XK3-B.

21. Disable the UPS by removing power from the UPS unit. (The DCP should go to the BYPASS mode without a glitch).

22. Wait approximately 2 minutes. The DCP UPS INLINE will indicate a failure, “F”. In the SYSLOG, an error message will appear: “DCP OUTPUT DISABLED” AND “DCP UPS BYPASSED”. *Verify these events when you return to the operator interface device (OID*.)

23. Restore power to the UPS and wait approximately 2 minutes. The DCP UPS INLINE should indicate a pass, “P,” and the UPS BYPASS SWITCH has returned to the INLINE state. *Verify these events when you return to the OID*.

24. If done in conjunction with Modification Note 47, proceed to Mod 47, page 14, and perform “AFTER INSTALLATION OF FIRMWARE UPGRADE.”

VERIFICATION PROCEDURE OF THE DCP CLASS II SSTDR, DOM, and UPSBC

1. Return to the OID and log on as **TECH**.

2. From the 1-minute screen, press: **MAINT - SEL DCP - DCP UPS**.

3. Verify the UPS by-pass switch CMDUPS INLINE is **ON** and the UPS INLINE is "P."

4. Press BYPAS to set the CMDUPS INLINE to "OFF".

5. Wait approximately 2 minutes, and the DCP UPS INLINE will indicate a failure, "F." (In the SYSLOG, an error message will appear: DCP UPS BYPASSED).

6. Press 12 HR pages to ensure all data are being collected from the sensors. Clear all failures on the MAINT pages for the ACU and DCP that were caused by powering down the system.

7. When complete, key **EXIT**.

8. Proceed to "AFTER INSTALLATION OF THE SSTDR, DOM, AND UPSBC."

AFTER INSTALLATION OF THE SSTDR, DOM, AND UPSBC

1. Contact the ASOS Operations and Monitoring Center at 1-800-242-8194 and inform the operator of:
   a. Your location.
   b. The installation of the SSTDR, DOM, and UPSBC has been completed.

2. Enter in the SYSLOG that maintenance has been completed.
   a. Key the **MAINT** screen.
   b. Key the **ACT** page.
   c. Key **FMK** - Enter the FMK number as follows: **Mod 55**. On the second line of the screen, verify that only Mod 55 is displayed. Complete by entering **Y** in the [Y/N] area if only Mod 55 is displayed. If other modifications are completed, make the appropriate log entry.
   d. Check the SYSLOG and verify that FMK message. Enter a comment in the SYSLOG stating the SSTDR has been installed.

REPORTING MODIFICATION

Target date for completion of this modification is 30 days for commissioned sites, and 45 days for non-commissioned sites, after the receipt of parts. Report the completed modification on a WS Form A-26, Maintenance Record, using the instructions in Engineering Handbook No. 4 (EHB-4), Engineering Management Reporting System (EMRS), part 2, appendix F. Report the modification to the DCP using the equipment code **ADCP** in block 7. Record the modification number of **55** in block_17a of the A-26. A sample WS Form A-26, Maintenance Record, has been included in appendix C.

Original Signed

John McNulty
Chief, Engineering Division

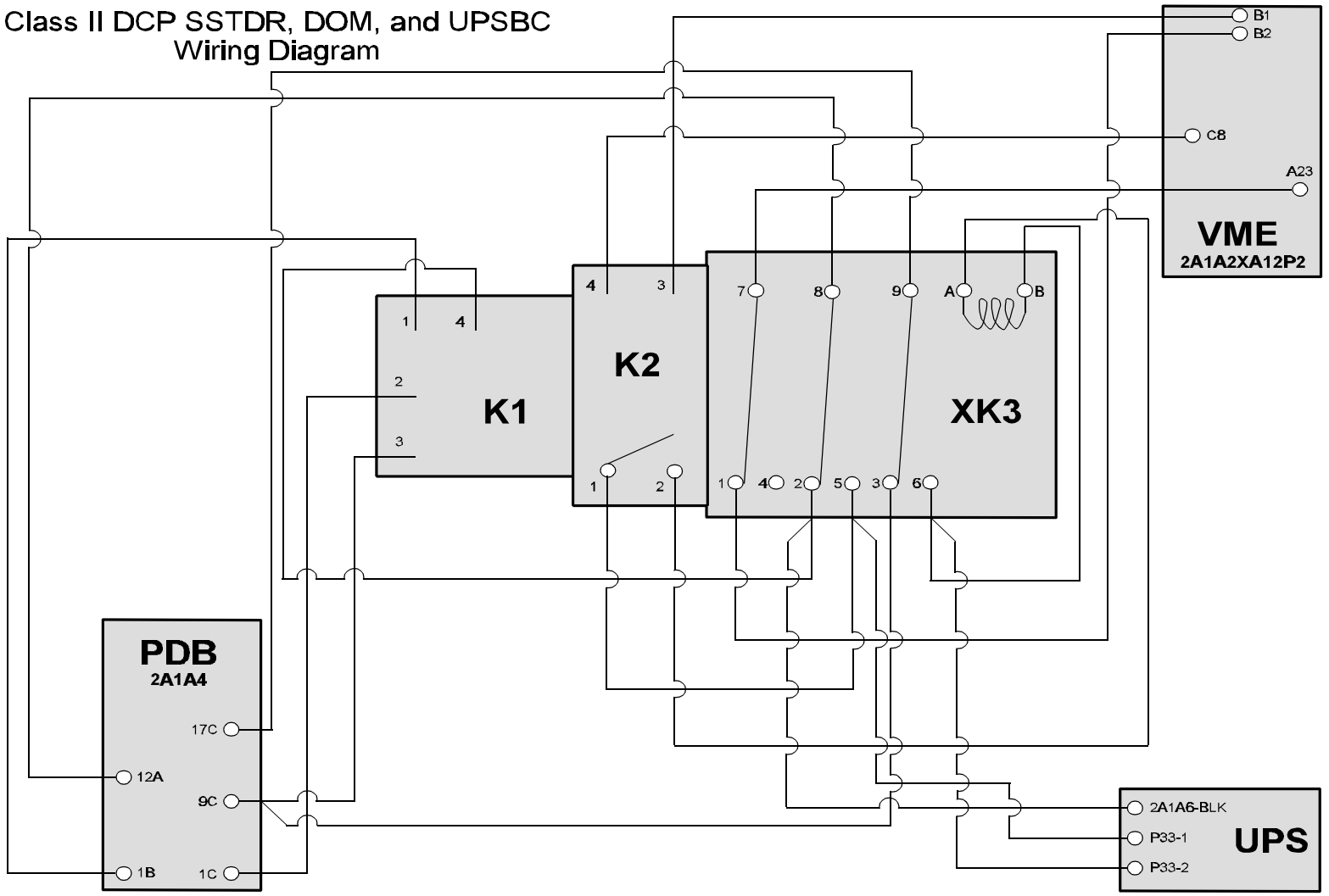
Appendix A - Test Sites
Appendix B - SSTDR, DOM, and UPSBC Wiring Diagram
Appendix C - Parts List
Appendix D - A-26 Form

The OT&E sites for the SSTDR, DOM, and UPSBC are:

SID	Name	Cmssion Status	Staffing		Config	Multiple Sensors	Comms	ZR	TSTM / ALDARS	GTA	ACE	RVR
			NWS	FAA								
CLE	Cleveland, OH	Y	FT	-	2 DCP	M	AFOS	ZR		-	-	-
CON	Concord, NH	Y	FT/C	-	1 DCP	-	PACE	ZR	TSTM	GTA	-	-
DCA	National Reagan, VA	Y	-	FT/C	1 DCP	B	PACE	ZR	-	-	ACE	EDIT
MRB	Martinsburg, WV	N	-	-	1 DCP	-	ADAS	ZR	ALDARS	GTA	-	-
THV	York, PA	Y	-	-	1 DCP	-	ADAS	ZR	ALDARS	GTA	-	-
ABQ	Albuquerque, NM	Y	FT	-	1 DCP	-	AFOS	-	-	-	-	-
ALI	Alice, TX	N	-	FT/C	1 DCP	-	ADAS	-	ALDARS	GTA	-	-
COT	Cotulla, TX	N	-	FT/C	1 DCP	-	ADAS		ALDARS	GTA	-	-
CRP	Corpus Christi, TX	Y	FT	-	1 DCP	-	AFOS	-	-	-	-	
CSV	Crossville, TN	N	-	FT/C	1 DCP	-	ADAS	ZR	ALDARS	GTA	-	-
DHT	Dalhart, TX	N	-	FT/C	1 DCP	-	ADAS		ALDARS	GTA	-	-
INK	Wink, TX	N	-	FT/C	1 DCP	-	ADAS	ZR	ALDARS	GTA	-	-
LCH	Lake Charles, LA	Y	FT	-	1 DCP	-	AFOS	-	-	-	-	-

SID	Name	Cmssion Status	Staffing		Config	Multiple Sensors	Comms	ZR	TSTM / ALDARS	GTA	ACE	RVR
			NWS	FAA								
MEM	Memphis, TN	N	-	FT/C	3 DCP	B	ADAS	ZR	ALDARS	-	-	NGRVR
OKC	Oklahoma City, OK	Y	-	FT/C	1 DCP	-	AFOS	ZR	-	-	ACE	NGRVR
PBF	Pine Buff, AR	N	-	FT/C	1DCP	-	ADAS	ZR	ALDARS	GTA	-	-
SSI	Brunswick, GA	N	-	FT/C	1 DCP	-	ADAS	-	ALDARS	GTA	-	-
TCC	Tucumcari, NM	N	-	FT/C	1 DCP	-	ADAS		ALDARS	GTA	-	-
GRR	Grand Rapids, MI	Y	FT	-	2 DCP	M	AFOS	ZR	-	-	-	-
ICT	Wichita, KS	Y	FT	-	1 DCP	-	AFOS	ZR	-	-	-	-
ISN	Williston, ND	Y	FT	-	1 DCP	-	PACE	ZR	TSTM	GTA	-	-
LBF	North Platte, NE	Y	FT	-	1 DCP	-	AFOS	ZR	-	GTA	-	-
MCW	Mason City, IA	N	-	FT/C	1 DCP	-	ADAS	ZR	ALDARS	GTA	-	-
OFK	Norfolk, NE	Y	FT/C	-	1 DCP	-	PACE	ZR	TSTM	GTA	-	-
ACV	Arcata, CA	N	-	FT/C	1 DCP	-	ADAS	-	ALDARS	GTA	-	-
DAG	Barstow, CA	N	-	PT/C	1 DCP	-	ADAS	-	ALDARS	GTA	-	-
ELY	Ely, NV	Y	FT/C	-	1 DCP	-	PACE	-	TSTM	GTA	-	-
HVR	Havre, MT	Y	PT/C	-	1 DCP	-	PACE	ZR	TSTM	GTA	-	-
LAX	Los Angeles, CA	Y	FT/C	-	2 DCP	B	PACE	-	-	-	-	NGRVR

SID	Name	Cmssion Status	Staffing		Config	Multiple Sensors	Comms	ZR	TSTM / ALDARS	GTA	ACE	RVR
			NWS	FAA								
OAK	Oakland, CA	N	-	FT/C	1 DCP	B	ADAS	-	ALDARS		-	
SEA	Seattle, WA	Y	-	FT/C	2 DCP	B	PACE	ZR	-	-	-	NGRVR
SLC	Salt Lake City, UT	Y	FT/C	-	2 DCP	M/B	AFOS	ZR	-	-	-	NGRVR
ADQ	Kodiak, AK	Y	FT	-	1 DCP	-	ADAS	ZR	-	-	-	-
FAI	Fairbanks, AK	Y	FT	-	2 DCP	M	ADAS	ZR	-	-	-	NGRVR
PAQ	Palmer, AK	Y	-	PT	1 DCP	-	GS-200	ZR	-	GTA	-	-
HNL	Honolulu, HI	Y	FT/C	-	2 DCP	B	ADAS	-	-	-	-	EDIT
ITO	Hilo, HI	Y			1 DCP	-	ADAS	-	-	-	-	-


Class II DCP SSTDR, DOM, and UPSBC
Wiring Diagram
B1
B2
C8
A23
VME
2A1A2XA12P2
K1
K2
XK3
PDB
2A1A4
17C
12A
9C
1B
1C
2A1A6-BLK
P33-1
P33-2
UPS

S100-FMK95DCP DCP UPS Bypass and Time Delay Relay	
Quantity	**Nomenclature**
1	W132 wire harness
2	3 screw terminal block
1	Rail mount
1	Airtronics cube/relay timer
1	Metal rail 7" x 1 3/8"
17	3 1/2" long wire tie wraps
1	K1 label
1	A9 label
1	8-32 x 1 1/4" #1 phillips pan head machine screw
2	8-32 x 1/2" #1 phillips pan head machine screw
2	#10 sheet metal screw #1 phillips pan head machine screw 1/2" long
2	7/32"ID x 7/16"OD flatwasher
2	5/32"ID x 5/16"OD flatwasher
2	5/32"ID x 5/16"OD lockwasher
2	5/32"ID x 9/32"OD lockwasher
1	W131 wire harness
12	3 1/2" long wire tie wrap
2	Insulated spade crimp-on terminals #14-16 AWG for #6 screw
1	Potter & Brumfield relay
1	Potter & Brumfield relay socket
1	Relay bail
1	Crouzet indicator fuse
1	A1A9XK3-3 label
1	A!A9XK3-2 label
1	P45-1 label
1	K2 label
1	K3 XK3 label

A-26 (EMRS)